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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|-----------------------|---------------------|------------------|
| 10/550,741 | 09/22/2005 | Radu Catalin Surdeanu | NL03 0347 US1 | 6084 |
| 65913 | 7590 | 06/14/2007 | EXAMINER | |
| NXP, B.V. NXP INTELLECTUAL PROPERTY DEPARTMENT M/S41-SJ 1109 MCKAY DRIVE SAN JOSE, CA 95131 | | | LIN, JOHN | |
| ART UNIT | | PAPER NUMBER | | 2815 |
| MAIL DATE | | DELIVERY MODE | | 06/14/2007 PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | |
|------------------------------|-----------------|-----------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/550,741 | SURDEANU ET AL. |
| | Examiner | Art Unit |
| | John Lin | 2815 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 25 May 2007.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 6-14 and 17-20 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 6-14 and 17-20 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 22 September 2005 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date 22 September 2005.

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
 5) Notice of Informal Patent Application
 6) Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of claims 6-14 and 17-20 in the reply filed on May 25, 2007 is acknowledged.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8, 18, and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The doping implant in the activated gate material having an abruptness is unclear because applicant has not defined what the limitation means. For the purpose of applying art, it will be interpreted as the abruptness of the doping profile.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 6-7, 9-10, 13-14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (US 6,160,300) in view of Tao et al. (US 6,399,515).

Claims 6, 7 and 17: Gardner et al. teach an MIS type semiconductor device (Figs. 1-7), comprising:

a semiconductor substrate (10),

a gate electrode (22) formed on the gate insulating film (12) and formed of gate material,

wherein the gate electrode comprises:

a first layer of activated crystalline gate material (14) having a first side oriented towards a substrate and a second side oriented away from the substrate, and

a second layer of gate material (20) at the second side of the first layer of activated crystalline gate material (columns 6 and 7, lines 11-67 and 1-32 respectively).

But Gardner et al. do not teach the first layer of activated crystalline gate material having a doping level of 10^9 ions/cm³, 10^{20} ions/cm³, 5×10^{20} ions/cm³ or higher. However, Tao et al. teach a gate electrode doped to a level greater than about 10^{20} dopant atoms per cubic centimeter in order to assure optimal conductivity (column 9, lines 14-37). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have doped the first layer of Gardner et al. at a doping level at 10^{20} ions/cm³ or greater in order to assure optimal conductivity.

Claims 9 and 10: Gardner et al. teach the second layer of gate material consists of amorphous or polycrystalline gate material (column 7, lines 21-32).

Claim 13: Gardner et al. teach a gate insulator (12, Fig. 5) is provided between the semiconductor substrate and the gate electrode (column 6, lines 10-50).

Claim 14: Gardner et al. teach the device is a transistor (abstract).

6. Claims 11, 12, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. in view of Tao et al. as applied to claims 6-7, 9-10, 13-14 and 17 above, and further in view of Sato et al. (US 5,290,712).

Claims 11, 12, and 20: Gardner et al. in view of Tao et al. teach all the limitations of claim 1, but do not teach the first layer is crystalline or very fine-grained, with grains below 5 nm or the grain size in the second layer is below about 40 nm or below about 30nm. However, Sato et al. teach a gate material having grain sizes of 10 Å to a few hundred Å (column 8, lines 33-37). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the grain sizes of the first and second layers of Gardner et al. between 10 Å to a few hundred Å in order to achieve desired conductivity.

7. Claims 8, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. in view of Tao et al. as applied to claim s 6-7, 9-10, 13-14 and 17 above, and further in view of Lee et al. (6,172,399).

Claims 8, 18, and 19: Gardner et al. in view of Tao et al. teach all the limitations of claim 1, but do not teach the doping implant in the activated gate material has an abruptness of about 1.5nm, 2nm or more or about 1nm. However, Lee et al. teach profile abruptness less than 10nm per order of magnitude charge in dopant

concentration in order to have better threshold voltage roll-off characteristics (column 1, lines 54-58). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to the doping implant in the activated gate material of Gardner et al. have an abruptness less than 10nm per order of magnitude charge in dopant concentration in order to have better threshold voltage roll-off characteristics. Also, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Lin whose telephone number is 571-270-1274. The examiner can normally be reached on M-Th 8:00-5:30EST F-8:30-5:00EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John Lin



EUGENE LEE
PRIMARY EXAMINER